



VOL III-NO 4

SURGEON'S CIRCULAR LETTER



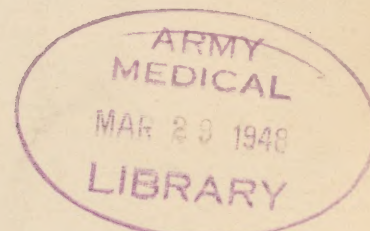
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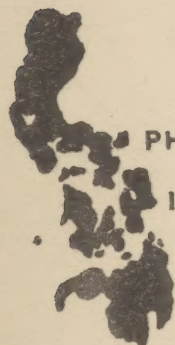
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EDITOR'S NOTE

In reviewing the list of authors who have contributed to the Surgeon's Circular Letter, it is noted that some branches of the Medical Department have seldom been represented. Suggestion is made that officers from all branches of the Medical Department utilize this publication as a means of exchanging professional and administrative ideas and experiences. The Editor of the Circular is eager to publish qualified articles by the Army Nurse Corps and the Medical Service Corps officers, as well as by our most frequent contributors - doctors, dentists, and veterinarians.

The Circular is published in three sections: Technical, Administrative, and Statistical. The Technical Section contains articles of a professional nature; the Administrative Section contains articles of a general administrative nature on personnel, hospitalization, evacuation, supply, construction, fiscal, hospital funds, hospital administration, and similar subjects; the Statistical Section is consolidated and tabulated entirely by the Surgeon's Office.

All members of the Medical Department, Far East Command, are cordially invited to submit accounts of the work of their various specialties, each of which forms an important part of the Medical Service of the Far East Command.

The heading for Section II of Part I, Administrative, should read: "Application for Admission to Examinations for American Board of Internal Medicine."

GENERAL HEADQUARTERS
FAR EAST COMMAND
MEDICAL SECTION

SURGEON'S CIRCULAR LETTER)
:
NUMBER. 4)

APO 500
1 April 1948

PART I

ADMINISTRATIVE

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I. Organization of the Medical Section

There were no changes in commissioned personnel currently assigned or attached to the Medical Section during the period covered by this publication.

II. Application for Admission to Examinations for American Medical Association

Information has been received from the American Board of Internal Medicine that applicants for admission to examinations conducted by that Board must be Fellows of the American Medical Association.

Regular Army medical officers who desire to make application for admission to these examinations and who have not already received their membership cards from the American Medical Association should make application immediately to The Secretary, American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois, for admission as Fellows in accordance with Chapter XII, Section 2, of the by-laws of the American Medical Association.

III. Miracle of Living

The new film, "Miracle of Living", produced under the technical supervision of The Surgeon General will be available for distribution in this command within the near future. This picture uses a new approach to the control of venereal disease. It emphasizes the positive factors which make for one's future family happiness. The worth of correct living and individual responsibility is stressed.

IV. Initial Distribution of Medical Film PMF 5075

Initial distribution of Professional Medical Film 5075, Reconstructions of the Lower Lip and Chin, (running time, 20 minutes, 3-16 mm print, color) is being made available to installations in the Far East Command. Distribution of film is made in accordance with recommendations from the Office of the Surgeon General, for showings to interested medical personnel.

V. Major Emma Vogel Heads Women's Medical Specialist Corps

Major Emma E. Vogel has been named first Chief of the Women's Medical Specialist Corps. The appointment carries with it the rank of colonel, under the Army and Navy Nurses Act of 1947. The chief of the new Corps will have supervision over the Dietitian Section, Physical Therapist Section and the Occupational Therapist Section. Major Vogel had been director of the Army Medical Department's physical therapists since August, 1942.

VI. Hospital Units in Organized Reserve Corps Affiliation Plan

Eleven medical schools and hospitals will sponsor Organized Reserve Corps affiliated units of the Army Medical Department.

Medical schools of the following universities have signed agreements of affiliation with the Department of the Army; Wisconsin, Illinois, Texas, Marquette, Ohio State, Duke and Baylor. Hospitals with affiliated units include Mount Sinai, New York City; Cook County, Chicago; Rochester General, Rochester, N. Y., and Boston City Hospital.

VII. Course of Study for Radiation Injury

Nineteen Army, Navy, Air Force, and Public Health Service physicians are presently studying the medical problems of the atomic age. They are enrolled in a six-months' course established at the University of Chicago in response to a request by the Armed Forces Special Weapons Project. The primary purpose of the course is to teach the physicians how to protect civilians and military personnel against radiation injury.

VIII. Army Medical Department Tests Chloromycetin

The United States Army Medical Department soon will stage the most extensive test yet made of the efficacy of chloromycetin, the only drug thus far discovered which is as effective against certain rickettsial disease-causing organisms as the sulfa drugs and penicillin are effective against bacteria. The test will be made in an effort to stop the spread of the dreaded scrub typhus in the Far East.

Dr. J. E. Smadel, director of virus research at the Army Medical Center, and one of the discoverers of this substance which may mark one of the important landmarks in the history of medicine, plans to fly to the Malay States early this Spring with a supply of the drug for the treatment of native plantation workers among whom scrub typhus is making serious inroads.

The carrier of the infection is a mite which is probably spread by rodents. During the war many of the plantations in Malaya were allowed to go back to brush. This resulted in a big population of infested rodents. Workers sent in to clear the plantations have suffered a heavy mortality rate.

The early experiments at the Army Medical Research and Graduate School showed that chloromycetin was especially effective against the micro-organism responsible for scrub typhus, which is also known as rickettsial tsutsugamushi and as "Japanese River Fever." This organism is related to the organism responsible for epidemic typhus and causes a quite similar disease, but typhus vaccine has proved useless as a protection against scrub typhus.

The new drug showed considerable potency against both typhus and scrub typhus organisms in experimental infections of incubated eggs and in animals. It also proved effective against several other maladies due to rickettsia, the still mysterious organisms which find a place between bacteria and the filterable viruses, tiniest of living things which are responsible for such maladies as influenza and poliomyelitis.

Experience has shown, however, that laboratory results do not always work out

in the field. Dr. Smadel has just returned to Washington from Mexico City where the new drug was tested against a small outbreak of typhus fever. The Army is not yet ready to announce the results. The proposed attack on scrub typhus is considered of even greater importance since this malady has proved difficult to treat in any known way and existing vaccines are not adequate in their protection.

The outlook is quite promising, according to the Surgeon General. At least a start has been made on specific drug treatment of the large class of rickettsial diseases which are responsible for some of the most devastating scourges of the human race. It has even been found to be mildly effective against one virus disease, psittacosis, and the door may have been opened to attack on most of these maladies. The psittacosis organism, however, is one of the largest of the viruses and just falls short of being classified as a rickettsia.

Scrub typhus was a major army problem in the Pacific during the war and the story of its ravages is extremely dramatic. Efforts to produce a vaccine against it cost the lives of three American and several British workers. Nothing was accomplished until the war was nearly over. An apparently effective vaccine finally was prepared from the macerated lungs and spleens of infected rodents but when this was given actual field tests it was found to be ineffective.

IX. Recent Department of the Army and FEC Publications

- AR 40-25, DA, 22 Jan 48. Medical Department - Women's Medical Specialist Corps - General Provisions.
- AR 40-106, C-1, DA, 23 Jan 48. Medical Department - Standards of Physical Examination for Commission or Warrant in Regular Army, National Guard of United States, Army of the United States, and Organized Reserves.
- AR 40-210, C-6, DA, 16 Jan 48. Medical Department - Prevention and Control of Communicable Diseases of Man.
- AR 600-375, DA, 6 Jan 48. Personnel - Prisoners, General Provisions, Sec III, Par 16, Sick.
- AR 605-250, DA, 16 Jan 48. Commissioned Officers - Army Retiring Boards.
- CIR 70, DA, 15 Dec 47. Sec IV, TM 5-600, Guides and Procedures, Repairs and Utilities, Changed.
- CIR 74, DA, 19 Dec 47. Sec III, Field Ration; Sec IV, Ration.
- CIR 79, DA, 29 Dec 47. Status of Army of the United States Officers.
- CIR 80, DA, 30 Dec 47. Sec II, Film and Film Strip - Distribution Announced.
- CIR 82, DA, 31 Dec 47. Assignment Readjustment Procedures (See page 9, Group XXII and Page 10, Group XXIX).
- CIR 1, DA, 1 Jan 48. Career Guidance Plan for Warrant Officers and Enlisted Personnel.
- CIR 3, DA, 5 Jan 48. Sec II, Dependents - Evacuation from Oversea Commands for Medical Reasons; Sec IV, Professional Training, Regular Army Officers at Civilian Institutions.
- CIR 4, DA, 7 Jan 48. Military Occupational Classification of Enlisted Personnel.
- CIR 5, DA, 7 Jan 48. Sec V, Ration Savings Funds; Sec VI, Rescission - T/O&E 8-572.
- CIR 6, DA, 9 Jan 48. Sec I, AR 35-2020, Pay and Allowances of Army Nurses and other Female Personnel of the Medical Dept., Changed.
- CIR 7, DA, 12 Jan 48. Sec IV, Courses at Civilian Institutions in Medical Specialties.
- CIR 8, DA, 13 Jan 48. Food Service Program.
- CIR 12, DA, 15 Jan 48, Sec I, Oversea Replacement System, United States Army, Par 5, Detachment of Patients.

CIR 13, DA, 15 Jan 48. Sec VIII, TM 8-233, Handbook for Pharmacy Technicians, Changed.

CIR 14, DA & AF, 16 Jan 48. Subsistence in Hospital Messes.

MEMO 40-590-12, DA, 12 Dec 47. Patients in Hospital.

MEMO 600-900-2, DA, 30 Dec 47. Venereal Disease Control Councils, Supersedes 600-900-2, 12 Jun 47.

MEMO 290-130-1, DA & AF (AF Letter 75-24), 9 Jan 48. Space Requirements for Oversea Movements; Sec II, Par 5, Patients.

MEMO 305-15-10, DA, 14 Jan 48. List of Recurring Reports Authorized for Preparation. Pages 43, 44, 45, and 46, Medical Department.

MEMO 345-50-4, DA, 8 Jan 48. Strength in Troop Program Sequence by Type of Personnel, Par 2f Pertaining to Patients.

MEMO 605-145-5, DA & AF (AF Letter 25-25), 5 Jan 48. Medical Officer Training and Utilization.

MEMO 615-205-2, DA, 20 Jan 48. Processing of Enlisted Overseas Returnees Returned for Reassignment; Par 14, Blood Typing and Immunization.

TC #1, DA, Dec 47, Supplementary Education and Training of Officers.

TC #2, DA, 30 Jan 48. Sec I, Graphic Training Aids 8-1 and 8-6 Changes.

TB MED 183, C-1, DA, 24 Nov 47, Visceral Leishmaniasis - Kala-azar.

TB MED 19, DA, 15 Jan 48. Facilities Provided for Tissue Pathology in US Army, Supersedes TB MED 19, 11 Mar 1944.

TB MED 148, DA, 15 Jan 48. Central Dental Laboratory Service, Supersedes TB MED 148, March 1945.

TB MED 167, C-1, DA, 14 Jan 48. Schistosomiasis Japonica.

CIR 4, GHQ, FEC, 23 Jan 48. Sec II, Equipment Issues over and above Authorized Allowances. See Par. 8.

PART II

TECHNICAL

SUBJECT	SECTION
Simultaneous Rupture of the Left Kidney and the Spleen.	X
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X. Simultaneous Rupture of the Left Kidney and the Spleen. Case Report by Captain Leonard J. Robison, MC, Chief of Surgical Service, 172nd Station Hospital, Sendai. Discussion by Lt. Col. Warner F. Bowers, MC, Surgical Consultant, Medical Section, General Headquarters, Far East Command.

Case Report: At approximately 1600 hours, 25 October 1947, a white male officer, 30 years of age, entered the 172nd Station Hospital, litter borne. His chief complaint was pain in the left flank and urination of red blood. About one hour previous to admission

he had received a forceful blow with a knee to the left flank region while playing football at Fryar Field, Japan.

Examination on admission revealed tenderness in the left costovertebral angle with moderate muscle spasm in the left flank region. There was evidence of red blood at the urethral meatus. Blood pressure was 106/62 and pulse rate was 92. The abdomen at this time was soft with moderate tenderness in the left paraumbilical region.

Ten hours after admission the patient vomited twice but was able to retain a soft diet and fluids. Four hours later there was an absence of peristaltic sounds, with partial return one hour later. Soon after this persistent emesis began and a 3 muscle spasm of the right upper quadrant developed. Twenty four hours after admission there was little change except that the urine was no longer red but dark brown in color. Forty hours after injury, abdominal distention, tympani and vomiting were present. The emesis now was dark brown instead of yellow. The blood pressure at this time was 130/80 and pulse rate was 80. Wangensteen suction was instituted and intravenous fluids were continued. The erythrocyte count was 4.7 million. Urinalysis showed red blood cells. The temperature was remaining around 101.4.

At this time it was felt that despite the absence of shock, bleeding continued and that the ileus was due to free blood in the peritoneal cavity, probably due to a splenic rupture. An xray flat plate of the abdomen showed paralytic ileus as evidenced by air-filled distended loops of small bowel and also there was an area of density in the upper left quadrant.

Supportive measures were continued until the arrival of the Surgical Consultant and approximately 60 hours after injury, the spleen was removed. A small tear in the splenic vein at the antero-superior mid-portion of the splenic pedicle was found. There were about 300 cc of free blood in the peritoneal cavity. Silk technique was used throughout. Post operatively, decompression by Wangensteen suction, intravenous fluid administration and blood replacement with hematocrit check, were carried out. The abdomen rapidly became flat and peristalsis was restored.

On the first and second post operative days a transient period of hypertension following blood and fluid infusion was noted, the maximum blood pressure being 180/130. The temperature showed a daily afternoon rise to 102 with return to normal at night. On the second post operative day, the Wangensteen suction was discontinued and liquid diet was tolerated. On the following day the abdomen was flat, non-tender and the afternoon temperature reached 101. On the fourth day, soft diet was ordered and the patient sat up unaided. On the seventh day, the patient was ambulatory, complained of an occasional gas pain and the afternoon temperature elevation persisted but was decreased. On the eighth day, the sutures were removed, the wound was well healed and was not tender. An upper urinary tract infection became evident on the eleventh day but this responded well to sulfa therapy. On the fifteenth day, there were no symptoms, the patient was ambulatory and gaining strength. He was transferred to the 49th General Hospital where after sick leave, a board of officers returned him to full active duty because he had attained complete return of strength and endurance.

Discussion: In the presence of gross hematuria, rupture of the kidney was obvious but it always must be remembered that any trauma sufficient to cause rupture of the kidney also may shatter other solid viscera such as the liver or spleen. In this case, the abdominal signs called for an accurate differential diagnosis. Mechanical intestinal obstruction was ruled out by the absence of crampy colicky pains and the absence of intestinal sounds on auscultation. This narrowed the consideration to paralytic ileus as the cause of abdominal distention. Although paralytic ileus may accompany kidney disease or trauma, the pain, rigidity and rebound tenderness suggested peritoneal irritation of bacterial or chemical origin as the cause. Rupture of a hollow viscus with bacterial peritonitis as the cause of paralytic ileus was excluded by the moderate physical findings although the temperature was much higher than usually seen with blood in the peritoneal cavity. An xray examination of the abdomen with the patient in the upright or left lateral decubitus position would have been helpful in ruling out hollow viscus rupture as free gas would have been expected in that case. This is a very sensitive examination, since as little as 4 cc of free air may be demonstrated under the diaphragm. Rupture of the bladder was ruled out and rupture of the pancreas would have caused extreme physical

findings so the field of consideration was narrowed to the liver or spleen. The absence of shock with gradually increasing severity of symptoms indicated slow hemorrhage for which the patient was able to compensate. However, had hemorrhage been more brisk, compensation would have been broken and shock would have supervened. Although no masses were palpable, a flat xray film of the abdomen showed exclusion of the distended loops of small bowel from the left upper quadrant. This confirmed the clinical diagnosis of rupture of the spleen with moderate intraperitoneal hemorrhage as the cause of the paralytic ileus. Pain in the left shoulder is not mentioned in the history but as I recall, it was present and pointed to chemical irritation of the left diaphragmatic leaf.

Rupture of the kidney rarely calls for operative interference unless there is severe hemorrhage or unless there is gross rupture of the pelvis with marked urinary extravasation. In this instance, with hematuria decreasing, there was no reason to explore the renal area. However, should it be necessary to explore the kidney and the splenic area, this can be done very well through a left kidney type incision. In 1940 I reported a case of simultaneous rupture of the left kidney and spleen where such a combined procedure was done. Splenectomy through a kidney approach is very easy as the incision immediately exposes the splenic pedicle. Ordinarily, however, the long left rectus incision is used for splenectomy. In abdominal trauma, the left rectus incision usually is best because it affords easy access to the liver and spleen, while through a right rectus incision, splenectomy is impossible without a mutilating and unnecessary T incision.

In any case of rupture of the spleen, complete splenectomy is the procedure of choice. Even a subcapsular hematoma indicates splenectomy because this hematoma, as it liquifies, attracts fluid by osmosis and may then rupture the capsule. I know of one such case where the patient who was being treated conservatively, exsanguinated during the night, ten days after injury.

Technically, splenectomy is one of the most difficult of abdominal procedures but by careful delivery and manual control of the pedicle, danger of severe hemorrhage can be minimized. Silk or cotton technique is advisable. After splenectomy, the only thing which keeps the patient in bed is the abdominal incision and as this case demonstrates, even with a long rectus incision, early ambulation is possible and desirable. Early ambulation now is a generally accepted procedure and certainly is valuable in prevention of thrombophlebitis and other vascular and pulmonary complications. Furthermore, early ambulation plus early feeding of solid diet markedly decrease postoperative gas pains, vomiting, constipation and loss of strength.

XI. The Care and Management of the Suicidal Patient by Captain Julius Hoffman, MC, Chief of Neuropsychiatric Service, 28th Station Hospital, Osaka, Japan.

One of the most disturbing factors in the whole field of human behavior is suicide. Consciously or not, the thought of self-destruction has entered the mind of every individual, normal or abnormal. However, when this thought becomes overwhelming to the point of action the danger of suicide is greatly increased. In spite of every precaution the unexpected then happens and the suicidal attempt is successful. But the more each individual case is considered and the proper precautions taken, the less the likelihood of the self-destruction attempt succeeding.

Under various circumstances the normal person contemplates suicide. When these are isolated and unassociated with other signs of mental disturbance there is little danger of the act being accomplished. In general it could be stated that (1) once a person actually attempts suicide he is a potential repeater and (2) every mentally abnormal individual is a possible (and frequently probable) "second offender".

The manic-depressive patient in the depressed phase (both agitated depression or depressed depression) has so strong a suicidal urge to do away with himself that many attempts are made until successful. Very similar but not quite as serious is the case of the reactive depressed patient whose depressions are on a more psychogenic basis and are reactions to an actual environmental strain. Because of the auditory hallucinations of an accusatory nature so prevalent in the schizophrenic, the patient afflicted with this illness will harm himself partially or in total in response to these voices' advice and

commands. When the repressed forces present in an individual with marked guilt and/or inadequacy feelings are released and become uninhibited via alcoholism the result may often be suicide. In somatic illnesses there is a very definite depressive phase. Not infrequently this is seen in chronic diseases after the acuteness has worn off and time allowed for the patient to contemplate all the possibilities. This is especially accentuated when the prognosis is poor. In this category one notes such somatic diseases as tuberculosis, cancer, general paresis, and pernicious anemia. As a sequela to some physical disfiguration whether post-traumatic or congenital, an individual with little "intestinal fortitude" and under special stress will be a likely candidate for suicide. People with delirious reactions from any source (toxic, metabolic, etc.) will sometimes make an attempt "to end it all". However, this is not suicide in the true sense of the term since it is not purposeful and is often the result of a marked fear, lack of understanding, grasp, hallucinations, and/or confusion. Quite often these people have illusions which lead them to killing themselves. They might misinterpret objects and their meanings and react according to their own misinterpretations. A frequent source of suicidal attempts come from the hysterical psychopathic personality who does these things for very much the same reason he does much else... as a warped means of satisfying his emotionally immature psyche. It is used to gain sympathy in a dramatic manner and to get the attention of as many people as possible (and often one person in particular). Furthermore, there are almost always the motives of spite and revenge which are generally preceded by threats and gestures in an attempt to terrify people and thereby gain the dominant position in the environment. Most often when actually attempted, the act is on impulse and quickly regretted. When the patient is suffering from paranoia or paranoid states the persistence of persecution delusion may cause him to try to kill himself in an attempt to escape.

The SIGNS OF LIKELY SUICIDAL ATTEMPTS are varied from time to time and from case to case. The clinical acumen of the medical personnel is frequently the greatest aid. However, it has been found that the following factors are frequently associated with oncoming suicidal attempts:

1. History of previous attempts: one previous try indicates that the individual is capable not only of thinking of destroying himself but, further, of carrying his thoughts into action. The substrata still remains and frequently the exciting factor in the same or slightly altered form will reappear.
2. Time of day: because the depressed patient usually feels worse and the changing of the shifts of ward personnel and the associated confusion suicide is most frequent in the morning (especially between 5-7 A.M.).
3. Depressive delusions: feelings of unworthiness, guilt, and/or inadequacy will often cause the patient to believe he is the cause of the world's misery and by ending his life he will bring peace on earth.
4. Depressed mood and activity: these are but the outward manifestations of an inner conflict most often of a self-derogatory nature.
5. Hallucinations: especially when the hallucinations are of an auditory and/or visual nature the patient may respond by killing himself.
6. Vegetative signs of depression: associated with the depression of mood and spirit there is also a depression of body activity so that one notices (a) constipation (b) insomnia (c) weight loss (d) anorexia (e) decreased sexual activity.
7. Loss of affection: this is especially noticed by ones previously the object of a great deal of affection and they are usually the ones who can notice this change first.
8. Sudden increased tension: when the depressed patient becomes agitated he is more eager to accomplish his demise. This can be noted by the otherwise unexplained increased pulse or blood pressure, increased tremulousness, and/or facial contortions.
9. Sudden recovery from depression: in contrast to the previous statement, a sudden apparent recovery may well be an attempt on the patient's part to throw the

medical personnel off guard and relax their vigil. When this is done he can more easily accomplish his ends.

10. Absence of a psychopathic personality in a patient talking of suicide: When talk of suicide is unaccompanied by melodrama or other suggestions of psychopathic personality...beware!!

METHODS OF SUICIDE: The ingenuity of some of the techniques devised for committing suicide approaches surprising cleverness and makes the prevention of these methods often seem inadequate and immature by comparison.

The most frequently used method of suicide is by hanging or strangulation. The material used varies with anything from a shoestring to a pajama belt and takes place anywhere from a utility closet to the ventilation shaft (or even by wrapping the bedsheets around the bedpost at one end, the neck at the other, and rolling out of bed). Next in order of frequency is cutting or piercing techniques using pins or broken glass (from watches or glasses) and usually choosing the throat and/or the wrists. When poisons are available (cleansing fluids or lye, etc.) they are not neglected. Drownings, burnings, jumping from high places, inhalation of poisonous fumes, and shooting oneself all contribute their share to decreasing the world population.

There are certain peculiarities concerning the technique of suicides. For example, there appears to be a vogue in the manner (e.g. by jumping from bridges or buildings, or overdose of sedatives, etc.). In times of national catastrophes such as bank failures, stock market crashes, or declaration of war the incidence markedly and suddenly increases. It is also important to note the exact mode of suicidal attempt since this might give one better idea of the patient's thought processes just prior to the incident. Thus, the hesitant or even undecided individual will frequently show this by several scratch marks on the wrist or throat either as a "tryout" or partial attempt.

THE PRECAUTIONS AGAINST SUICIDE: The precautions are often based on the medical officer's judgment of the situation and the factors in the case. It remains for him to make the final decision as to what degree the precautions should be carried out and what relaxations can be allowed.

It is important to stress again that anyone who has tried previously is a good candidate to try again. Even in those people who do it as a sympathy-gaining mechanism it should be remembered that they might again make the attempt but with the mistake of succeeding.

1. A list of all patients on suicidal precautions should be kept by the physician in charge of the ward and all the ward personnel should be well acquainted with it. However, no patient should gain access to the list. It should be kept up to date with daily checks.

2. First priority in the diagnosis, treatment, and disposition of the suicidal patient should be maintained.

3. Constant observation is of prime importance, but this should be done as subtly and tactfully as possible. At no time should he be allowed to remain alone and all enclosed places where suicide may take place (such as utility rooms, toilets, closets, etc.) should be locked when not in use. Frequent rounds at irregular time intervals should be made at night. Special vigil should be maintained during the morning hours and during the time of changing of the shifts. Pharmacological and mechanical restraints may be used for those patients who throw themselves on the floor or against the walls.

4. Every means, mechanical or chemical, should be kept from the patient. A constant check on the narcotics (which should be kept under double lock and key at all times) should be made. Food should be eaten only with a spoon (which also should be counted). Cleaning utensils and chemicals should be kept out of the reach of the patient and surgical dressings should be kept at a minimum and a detailed note made of the exact type of dressing. When drugs are prescribed they should be taken by the patient under

the observation of the ward personnel and body orifices should be checked (especially on admission) for a hidden supply. An emergency tray should be on hand in case of suicide on the ward. This should include cardio respiratory stimulants (e.g. caffeine sodium benzoate, coramine, picroxin, etc.), sedatives (e.g. quick acting for intravenous use barbiturate), emetics (e.g. apomorphine), specific antidotes, mechanical requirements (e.g. airways, stomach tubes, tongue blades, restraints, suture material, etc.), and a brief list of instructions for the use of these as needed. All permanent fixtures within the patient's room should be out of reach of the patient and nothing breakable should be allowed.

In conclusion it should be said that although one hundred percent prevention is next to impossible, close observation and carefulness will result in an almost perfect record.

XII. Interpretation of Laboratory Serologic Tests by Major T. O. Berge, MSC, Chief of Virus and Rickettsial Section, 406th Medical General Laboratory, Tokyo, Japan and Mr. Walter L. Barksdale, Chief of Section of Bacteriology, 406th Medical General Laboratory, Tokyo, Japan.

The demonstration of specific antibodies by proper serologic technic affords presumptive evidence of past or present infection with specific etiologic agents. Interpretation of results of serologic tests with specimens from patients suspected of various diseases can be made in many instances only in connection with observation of clinical symptoms of the diseases. This is particularly true when single specimens only have been submitted for examination. Unless a definite rise in titer of specific antibodies can be demonstrated during the course of disease, laboratory findings per se may be without value or actually deceiving.

In general, it can be stated that if diagnostic significance is to be attached to results of serologic tests, a minimum of two serum specimens must be examined. The first specimen should be drawn as soon as possible after onset of clinical signs and symptoms and the other 10 days to 3 weeks later (see Circular 98, Headquarters Eighth Army, 5 June 1947). Usually this interval between the drawing of specimens in the acute and convalescent phases is long enough to permit a significant rise in antibody titer to be detected. However, certain neutralizing antibodies frequently appear later than other types of antibodies, and in these cases a third specimen should be drawn 6 to 8 weeks after onset.

EPIDEMIC AND MURINE TYPHUS FEVERS: Serologic tests available for aid in the diagnosis of typhus fever, either of the epidemic or the murine type, include the Weil-Felix reaction, complement-fixation and rickettsial agglutination tests. Each type of reaction may become positive and reach a maximum titer at different stages of the disease.

a. Weil-Felix Test: Usually between the 7th and 15th day after initial symptoms, patients suffering from epidemic or murine typhus develop agglutinins capable of clumping or agglutinating Proteus OX19. Proteus vulgaris OX19 is an O (non-motile) variant of Proteus vulgaris, a gram negative bacillus which per se has no connection with the typhus fevers. As an antigen Proteus OX19 is relatively complex. A fraction of its antigen complex apparently is also a component common to the antigen complex of the rickettsiae of epidemic and murine typhus. The consequent result in this case is para-agglutination where the agglutinins formed against a rickettsial antigen cause agglutination of an identical bacterial antigenic component. It might be expected that an antigen as complex as Proteus OX19 might also be agglutinated by antisera specific for its components not common to the rickettsia. Such is often the case. Hence, the Weil-Felix reaction, as these Proteus agglutinations by rickettsial antisera are termed, are not necessarily specific. In other words, patients with F.U.O's often develop agglutinins for Proteus OX19. Such agglutinins are usually low in titer (seldom over 1:640) and their presence, in the patient's serum is of short duration. On the other hand, most patients having typhus fever (murine or epidemic) usually do not show complete loss of agglutinins until about the 45th day of the disease or thereafter.

Serum samples in suspected cases of typhus should be taken on or about the seventh, twelfth and sixteenth day of the disease. If the line obtained from plotting these titers shows either a straight ascent or exhibits a rise and fall, and if the clinical symptoms are compatible with a diagnosis of typhus, the Weil-Felix reaction in such a case may be considered as laboratory confirmation.

Note: Experience in this theatre has shown that individuals immunized against typhus may attain titers as high as 1:640 and the appearance of such titer is gradual. It should not be assumed from this and the foregoing discussion that only titers above 1:640 are significant. Bona fide cases of typhus have shown a titer line starting at 1:20 proceeding to 1:80 and thence to 1:160 with gradual diminution after the 45th day.

b. Complement-Fixation Test: The typhus complement-fixation test, employing specially purified rickettsial antigens, is specific in the sense that it is not known to give positive results with immune serum from diseases other than typhus fever. In the absence of previous vaccination against typhus fever, a titer even as low as 1:10 can be considered positive. On the other hand, the complement-fixation test may remain positive in low titer for a relatively long period of time after recovery from the disease, so that a single low-titer reaction (1:10 to 1:40) may represent past experience with the disease and not necessarily current infection. Titers of 1:80 or greater can ordinarily be regarded as indicative of recent infection, while demonstration of a rising titer, even though the maximum level is not high, may be considered diagnostic.

In most instances, epidemic and murine typhus fevers can be differentiated from each other on the basis of complement-fixation tests in non-vaccinated individuals. When carefully washed antigens are employed, little or no cross-reaction occurs in the case of epidemic typhus. A greater degree of cross-reaction is often noted in murine typhus sera, but in the majority of cases murine antibody titer is definitely higher than epidemic antibody titer. In what appear to be intermediate cases, titer of epidemic and murine antibodies may be equal or nearly so; these cases seem to be more closely related to murine than to typical epidemic typhus fever.

In the non-vaccinated patient, complement-fixation antibody titers become positive and reach maximum levels more slowly than do either Weil-Felix or rickettsial agglutination antibodies. The reaction seldom becomes positive in less than 10 days after onset and may be delayed as long as 21 to 30 days. Negative complement-fixation results obtained on specimens drawn during the acute stage of disease or in early convalescence, therefore, do not exclude typhus fever as a diagnosis.

In the case of previously vaccinated individuals, the serologic picture may be markedly altered. A titer of 1:10 or 1:20 for epidemic antibody may be found in healthy individuals following a typhus immunization series (commercial American typhus vaccine is prepared from an epidemic typhus strain). When such individuals contract typhus fever, the complement-fixing antibody titer may become positive or show a rise in titer much more rapidly than in non-vaccinated individuals owing to an anamnestic response.

In murine typhus cases occurring in individuals immunized against epidemic typhus, complement-fixing antibody for epidemic typhus has been found often to appear earlier than murine antibody and may reach a titer as high or higher than the latter. In such cases, serologic differentiation may be impossible by means of complement-fixation tests alone.

c. Rickettsial Agglutination Test: Rickettsial agglutination reactions have been found to become positive somewhat earlier in typhus fever than the complement fixation test. The agglutination test is particularly useful in the laboratory diagnosis of murine typhus where the reaction appears to show positive results with greater regularity than is the case with complement-fixation with purified rickettsial antigens. While a cross-reaction is almost invariably found, agglutination titer usually is significantly higher for the specific typhus strain causing the disease; this has been found to be true also in the case of murine typhus patients who have been immunized with epidemic typhus vaccine.

RESTRICTED

The limiting factor in the use of the rickettsial agglutination test for routine laboratory diagnostic procedures is the relatively large amount of antigen required for the quantitative test as compared with that required for complement-fixation.

INFLUENZA: The influenza virus erythrocyte agglutination-inhibition technic is now extensively employed in laboratory influenza diagnostic procedures. Chicken or human "O" type red cells are most commonly used. Convalescent serum from influenza patients contains specific antibodies which inhibit the ability of the causal influenza strain to agglutinate erythrocytes. Duplicate serum specimens (acute phase and convalescent phase) are essential in this test since a large proportion of apparently normal individuals show a relatively high antibody content either as a result of past experience with the disease or following immunization with influenza virus vaccine. Only a four-fold or greater rise in antibody titer can be considered significant for diagnostic purposes (i.e., an increase from 1:64 to 1:256, or from 1:256 to 1:1024 or greater).

Influenza virus agglutination-inhibition tests at present are carried out employing influenza A (PR8 strain) and influenza B (Lee strain) viruses as antigens. Negative reports with these strains (no increase in titer of second specimen over that of first specimen) mean only that the disease was not due to infection with influenza virus antigenically related to either of these strains, or that specimens were drawn at the wrong stages of illness. Influenza antibodies appear more rapidly in blood serum than many other types of antibodies, and if the acute phase specimen is drawn too long after onset, a significant rise in antibody level in the convalescent phase specimen may not be demonstrable.

VIRUS DISEASES OF THE CENTRAL NERVOUS SYSTEM: The most commonly employed serologic tests for laboratory diagnosis of virus diseases of the central nervous system are complement-fixation tests and neutralization (virus inactivation) tests. In both cases, the same general remarks as applied to other serologic tests are also applicable here.

a. Complement-Fixation Tests: Virus antigens employed in complement-fixation reactions are generally purified or partially purified extracts of infected animal or chick embryonic tissues. As controls for antigen specificity, extracts of normal tissues are prepared and used in the same manner, and the test set up with a battery of antigens prepared from related viruses.

Experience has indicated that in the case of Japanese B Encephalitis, ordinary immunization procedures induces only negligible response if any in complement-fixing antibodies, with the possible exception of very young children. However, in endemic areas such as exist in certain parts of Japan and Okinawa, sub-clinical attacks of the disease may be responsible for antibodies demonstrable by means of the complement-fixation test. Here again it should be remembered that serologic evidence of a current infection can be considered conclusive only when a change from negative to positive occurs, or where at least a four-fold increase in antibody content can be shown during the course of disease.

Complement-fixing antibodies for virus CNS diseases can, in general, not be expected to appear in measurable amounts in serum in less than 10 to 14 days after onset.

b. Virus Neutralization Tests: Specific antibodies which neutralize or inactivate the causal virus agents tend to appear somewhat later and persist for a longer period of time than do complement-fixing antibodies. In lymphocytic choriomeningitis, neutralizing antibodies may not be found in detectable quantity until almost two months after onset of the disease. Again, demonstration of a significant rise in specific antibody content alone can be considered as of conclusive diagnostic value.

FEBRILE AGGLUTINATIONS: Typhoid. Only O agglutinations should be requested. If a significant rise in titer is obtained in the course of the suspected case of typhoid fever, a Vi agglutination should be requested also. (Typhoid diagnosis is more easily made on blood culture than by agglutination).

Paratyphoids. As above. Confirmation by blood culture.

Brucella. Seldom in chronic cases of brucellosis are agglutinins demonstrable. Repeated blood cultures offer more helpful data.

Cholera. Do not order agglutinations for cholera. When cholera is suspected use bacteriologic methods of laboratory confirmation.

Cheever (New England J. Med. 1947, 237:584-590) has summarized admirably the conclusions which may be drawn from various combinations of reactions, as listed below:

1. Serum drawn during acute phase: NEGATIVE; serum drawn during convalescent phase: NEGATIVE. CONCLUSION: Disease not due to virus tested.
2. Serum drawn during acute phase: NEGATIVE; serum drawn during convalescent phase: POSITIVE. CONCLUSION: Disease presumably due to virus tested.
3. Serum drawn during acute phase: POSITIVE; serum drawn during convalescent phase: POSITIVE (significant rise in titer). CONCLUSION: Disease presumably due to virus tested.
4. Serum drawn during acute phase: POSITIVE; serum drawn during convalescent phase: POSITIVE (No significant rise in titer). CONCLUSION: (1) Contact with virus tested sometime in the past, with no relation to present illness. (2) First serum drawn too late in course of disease. (3) Second serum drawn too early in course of disease.
5. Serum drawn during acute phase: NOT TESTED; serum drawn during convalescent phase: NEGATIVE. CONCLUSION: Disease not due to virus tested.
6. Serum drawn during acute phase: NOT TESTED; serum drawn during convalescent phase: POSITIVE. CONCLUSION: Interpretation impossible, unless titer of second specimen is at least as high as that usually found in persons recently recovered from the disease in question; in such cases a presumptive serologic diagnosis may be made on the basis of these suggestive findings.

XIII. The Serodiagnosis of Amebiasis

The complement-fixation test for amebiasis is believed to be a valuable laboratory adjunct to the diagnosis of extraintestinal amebiasis. The test is especially indicated in suspected cases of amebic abscess of liver or lung and in amebic hepatitis. In such cases, the *Endameba histolytica* may not be detected by stool examinations.

...At present the complement-fixation test for amebiasis is available to Army installations as a service of the Army Medical Center. Specimens of blood or sterile serum, submitted for such examination, should be accompanied by pertinent details relative to the patient's history, clinical manifestations, and other laboratory findings, and should be sent to the Director, Medical Department Professional Service Schools, Army Medical Center, Washington 12, D.C. (Attention: Division of Serology.¹)

R. E. Blount

XIV. Streptomycin. Department of the Army, Office of the Surgeon General, Washington 25, D. C.

1. General. Original letter of this office and inclosures dated 1 April 1946, subject: "Streptomycin," are rescinded; and henceforth the following instructions, data, and information will be used as a guide in professional practice, preparation of streptomycin reports, and requisitioning:

a. Requisitioning. The system of supply of Item No. 1-609-840, Streptomycin, 1 Gram, for ZI installations is published in medical supply memoranda from general distribution depots. The supply of streptomycin to overseas commands is covered by separate instructions furnished through ports of embarkation.

b. Submission of Clinical Histories. A copy of Streptomycin Report Form No. 34, Office of The Surgeon General, will be filled out and transmitted to the Office of the Surgeon General, Department of the Army, Washington 25, D. C., at monthly intervals

¹"The Serodiagnosis of Amebiasis" by John F. Kent. THE BULLETIN of the U.S. Army Medical Department. Volume 7, Page 47 (July 1947).

for each case treated with streptomycin. Copies of this form may be obtained upon request to this office.

c. Professional Practice. Because adequate supplies of streptomycin are available to all hospitals, it is intended that henceforth this drug will be used in the treatment of every patient for whose disease it is the indicated choice of therapy. To date, sufficient information has not accumulated to define fully the place of streptomycin in all medical and surgical conditions in which the drug might be of potential value. Also, further information is necessary regarding the development of untoward reactions during streptomycin therapy. The limits of the stability of streptomycin as they relate to potency under variable conditions of storage likewise are not fully determined, and the expiration dates currently in use, although empirically established, take into consideration all known safety factors. With this background, it is necessary that the individual streptomycin case reports (SGO Form 34) be prepared with careful attention to all details.

2. Streptomycin.

a. General Statement. Streptomycin has now been demonstrated to be the drug of choice in certain gram-negative and acid-fast infections. In addition, it is a useful alternative agent for certain infections caused by other organisms which are resistant to the sulfonamides and penicillin but susceptible to streptomycin. Data compiled for over two years from U. S. Army hospitals and numerous civilian clinics warrant reappraisal of the conditions for which streptomycin is most useful. This letter embodies the latest data on clinical application of streptomycin, dosage, and methods of administration, pharmacology, toxicity, and instructions on the laboratory coordination necessary in obtaining optimal results with streptomycin therapy.

b. Clinical Application of Streptomycin. A list of micro-organisms which have been found to be susceptible to streptomycin in vitro appears in Table II.

(1) Conditions in Which Streptomycin is the Drug of Choice.

Tularemia. The drug is effective in all types, including the glandular and the typhoidal. In general, the therapeutic response is rapid with permanent cure resulting in the majority of cases. Topical application to the ulcerated buboes may be of value in providing high levels in relatively avascular tissues. Aspiration of fluctuant masses with replacement by streptomycin may obviate incision and drainage. The usual dosage is 1 to 2 Gms. daily for at least five days.

Urinary Tract Infections. Satisfactory results are obtained in this type of infection only when: (1) there is a free, unobstructed flow of urine; (2) the organisms are of proved susceptibility to the drug; and (3) the dosage is adequate for maintaining an effective level of drug in the blood. Three days' therapy in an intramuscular dosage of 1.5 to 2 Gms. a day is sufficient in most cases. Alkalinization of the urine may be a factor in improving the rate of cure. The drug is a valuable aid to urological surgery when infection is a complicating feature. Streptomycin has an effect on uncomplicated gonorrheal urethritis similar to that of penicillin. The drug is of no proved value in chronic prostatitis.

Influenza Bacillus Meningitis, Tracheobronchitis, and Pneumonia. These conditions respond favorably to streptomycin therapy. Meningitis requires the use of the drug intrathecally as well as systemically. The average intrathecal dose is 1 mg./kg. once daily for no longer than seven days. Combined therapy, such as the use of sulfadiazine, antiserum, and streptomycin, may be desirable in the severe infection. The addition of penicillin to streptomycin may be advantageous in infections associated with the hemolytic streptococci, the pneumococci, and staphylococci.

Gram-negative Bacillary Infections with Bacteremia, Meningitis, or Pneumonia. Best results are obtained when the suppurating focus is amenable to, and has the benefit of, surgical drainage. Streptomycin therapy can be expected to be successful if the organisms are susceptible in vitro, if the dosage is adequate, if the interval between doses provides bacteriostatic blood levels; if the duration of treatment is long enough, and if due consideration is given to management of the patient as a whole. The usual dosage is 3 Gms. a day for seven to 14 days, intramuscularly administered.

Tuberculous Laryngitis and Pharyngitis. Clinical responses may be expected in these conditions provided the organisms are not initially drug-fast. Combined aerosol and parenteral therapy may be employed, and the duration of therapy is eight weeks or longer. The maximum total daily dosage by aerosol is 0.5 Gm. and the parenteral dose, 1.0 to 1.5 Gm.

Exudative Type of Pulmonary Tuberculosis, Hematogenous Tuberculosis with Soft Tissue Involvement, and Tuberculous Meningitis. Streptomycin has some beneficial effects in these types of tuberculosis but the treatment is prolonged and, when the total daily dosage exceeds 1.5 Gm. a day, is accompanied by dangerous untoward reactions which may be serious.

(2) Conditions in Which Streptomycin has been Found Useful.

Subacute Bacterial Endocarditis and Gram-positive Coccal Bacteremias Caused by Organisms Unaffected by Penicillin but Sensitive to Streptomycin. Subacute bacterial endocarditis and bacteriemias without endocarditis should be given streptomycin when: (1) infections are due to penicillin-resistant enterococci (non-hemolytic streptococci); (2) infections are due to gram-negative bacilli; and (3) infections have failed to respond to maximal penicillin therapy. Usually two to four weeks of therapy will be required, in a dosage of 2 to 3 Gms. a day. One must be prepared to accept the risk of development of labyrinthine disturbances in cases requiring therapy beyond 14 days.

Brucellosis. Limited experience indicates that streptomycin supplemented by sulfonamide therapy is worthy of further trial in the acute or bacteremic form of brucellosis. Best results have been obtained with a daily dosage of 3 Gms. of streptomycin intramuscularly and 6 Gms. of sulfadiazine orally for a period of 21 days. Again, it is cautioned that labyrinthine disturbances may be a consequence of streptomycin therapy. The antibiotic is of no value in "chronic" brucellosis.

Ophthalmic Infections due to Gram-negative Organisms. Good results are reported from local (1 per cent) and combined streptomycin therapy in acute infections, in corneal ulcers, acute conjunctivitis, and other acute infections of the eye due to susceptible gram-negative organisms. The efficacy of streptomycin in chronic and non-specific conditions of the eye is questionable.

Infections of the Ear. Suppurative otitis media and otitis externa due to susceptible gram-negative and mixed infections may show improvement on local (1 per cent) and parenteral streptomycin therapy in combination with the usual otolaryngological management.

Infections of the Gastro-intestinal Tract. Streptomycin seems to be very effective in bacillary dysentery due to *Shigella* organisms, and warrants trial in those cases which are not benefited by sulfa drugs. Combined oral and parenteral administration of the antibiotic is most consistently beneficial. Such conditions as non-specific idiopathic ulcerative colitis, enterocolitis, and regional ileitis are not suitable conditions for the use of streptomycin, although occasionally they may be benefited temporarily. Insufficient experience with streptomycin for *Salmonella* infections prohibits a definitive statement at this time.

Preoperative Preparation of the Intestinal Tract for Surgery. The potent sterilizing effect of streptomycin on susceptible bacteria is invaluable for preoperative preparation of the intestinal tract. The drug should be given orally in doses of 1 Gm. every eight hours three to four days prior to elective resection.

Peritonitis of Fecal Origin. While streptomycin has a beneficial effect in the case of early diffuse peritonitis, the optimal treatment of this condition may involve the simultaneous use of large daily doses of both penicillin (600,000 units) and streptomycin (3 Gms.) for seven to 14 days.

(3) Conditions in which Streptomycin may be Helpful, but which have not yet been Investigated Sufficiently to Determine its Relative Value. Solitary brain abscess; nasal and sinus infections; trachoma; pertussis; chronic bronchiectasis; empyema and lung abscess; infections of skin, wounds, and bone; biliary tract infections; enteric infections, including typhoid fever, para-typhoid fever, cholera, and plague; chancroid;

granuloma inguinale; cutaneous, ophthalmic, genito-urinary, peritoneal, and osseous tuberculosis; gonorrhea.

c. Pharmacology. Streptomycin is similar to penicillin in its absorption and excretion following parenteral administration, although the rate is considered to be somewhat slower, except that no absorption into the general circulation takes place following administration orally or by nebulization. The drug is mobilized for excretion predominantly in the kidney and to a slight degree in the bile. It has been recovered in significant amounts in peritoneal, pericardial, pleural, ocular, and amniotic fluids, but not in prostatic fluid, brain, lymph nodes or pus from soft tissue abscesses. Repeated injections are necessary for the maintenance of therapeutic blood levels. As with penicillin, the drug does not pass known anatomical barriers; i.e., blood-brain, blood-pleura, blood-intestine; therefore, it is necessary to supplement its parenteral use with appropriate local administration. Inhalation by aerosol is a satisfactory means of introducing the drug into the tracheobronchial tree. When administered orally, streptomycin will provide high therapeutic concentration in the intestinal tract because of the absence of absorption of the drug and nearly complete excretion in the feces.

d. Preparation for Use, Methods of Administration, and Dosage. As with any chemotherapeutic agent, dosage requirements vary with the susceptibility of the organism to streptomycin, and the type, severity, and location of the infection. The maxim, "Give enough--soon enough--long enough," applies particularly to this antibiotic. Drug resistance is a common feature in infections unaffected or only partially suppressed by streptomycin therapy. For this reason it is essential that the infection be brought under control as quickly as possible. A dosage table has been prepared as a general guide for the therapy of infections (Table I). Body fluid and blood levels usually achieved by these doses are given. These doses are adequate for the treatment of the majority of infections susceptible to streptomycin. It will be noted that for children the dose should be reduced in proportion to the body weight.

Streptomycin is marketed in 1 Gm.* and 2 Gm.* vials, and is usually dissolved in sterile physiological salt solution or water, in a concentration of 10 per cent. The dry powder and the solutions of streptomycin are thermostable at ordinary temperatures, and refrigerator storage is optional. Streptomycin solutions are not self-sterilizing; therefore, the usual aseptic precautions must be taken to avoid contamination during preparation and administration of the drug. The intermittent intramuscular route of administration is the one of choice for the maintenance of therapeutic blood levels. The injection is followed by some pain and soreness, which may be alleviated by dissolving the drug in one or two per cent aqueous sterile procaine. The deltoid, gluteal, and thigh muscles are the most suitable locations, and it is advisable to rotate the doses among these sites. There is no evidence that the subcutaneous or intravenous methods of administration offer any advantage over the intramuscular. Attempts to obviate the need for frequent injections by introducing mixtures of streptomycin in beeswax and peanut-oil intramuscularly so far have not been fruitful.

For administration directly into the pleural cavity, the drug should be dissolved in as small a volume of saline as practicable. For nebulization, 0.05 Gm. of streptomycin should be dissolved in 1 cc. of solution. For intrathecal injections, from 0.025 to 0.1 Gm. dissolved in saline may be injected into the subarachnoid space every 12 to 24 hours. It is emphasized that the concentration injected should not exceed 20 mg./cc. lest irritative effects on the central nervous system become manifest. Solution in water or saline has been found satisfactory for administering the drug orally since solutions are entirely palatable, being tasteless and odorless. The usual dosage is 1 Gm. given every six to eight hours. Topical application in the form of a continuous drip is useful in the occasional case. Streptomycin is of no value as an irrigating solution because contact is not maintained for a sufficient length of time to effect bacteriostasis. For surface application, the drug may be incorporated into a water-soluble ("Carbowax" 1500) or emulsion type of base, in a 1:100 concentration (10 mg. per Gm. of base). Topical or local administration is generally combined with systemic administration.

*One microgram has an activity almost identical with one "S" unit as originally described by Waksman. One gram of streptomycin is therefore equivalent to 1,000,000 "S" units.

e. Untoward Reactions. The intramuscular administration of streptomycin in doses up to 3 Gms. a day is well tolerated for courses up to two weeks. Untoward reactions are relatively common, but these are rarely of sufficient importance to warrant interruption of therapy. Local irritation may be alleviated by a solution with streptomycin in one or two per cent sterile procaine, and by rotation of the sites of injection. Paraesthesias of the face and fingers are transient and disappear on continued therapy. Likewise, vertigo and tinnitus appearing on the first few days of therapy are usually transient, and do not contraindicate further administration of the drug. The effects on the kidney of streptomycin manifested by proteinuria and occasional cylindruria are clinically unimportant except where there is previous extensive damage and protracted courses of the drug are necessary. Because of this possibility renal function should be tested previous to and during prolonged use of the drug. Dermatitis can occur after the fifth day of therapy and may tend to disappear on continued treatment. Prompt remission follows withdrawal of the drug. Medical Department items, Stock No. 1-168-350, b-Dimethylaminoethyl Benzhydryl Ether Hydrochloride Capsules, 0.05 Gm. ($\frac{3}{4}$ gr.), 100s.; and Stock No. 1-117-735, Calcium Gluconate Injection, 1 Gm. (15 gr.), 10 cc., 12s.; as well as Pyribenzamine, afford symptomatic relief. Exfoliative dermatitis appears only after prolonged therapy. It is a dangerous toxic reaction and its appearance should contraindicate further administration of streptomycin. Vestibular and auditory nerve disturbances of streptomycin do occur in certain individuals, especially if treatment in daily doses greater than 1.5 Gm. is continued beyond two weeks. The frequency of this reaction increases with large doses and protracted courses of therapy. The patient usually complains of persisting dizziness and difficulty in focusing his gaze. There is no response to the introduction of ice water into the auditory canal (Kobrak caloric test). The most important warning of this toxic effect is a positive Romberg sign. Occasionally audiogram tests reveal deafness of which the patient is unaware. Fortunately, the optic nerve compensates for the gyroscopic function of the vestibular nerve and the patient gradually recovers from his symptoms. Where damage to the eighth nerve is demonstrated as due to streptomycin, further therapy is contraindicated. Rare instances of bone marrow depression, particularly neutropenia, have been noted and one case of fatal agranulocytosis attributable to streptomycin therapy has been reported to this office. Thus, the toxicity of the drug is sufficiently low to justify its use wherever indicated for short courses of therapy; on the other hand, the high incidence of effects on the eighth nerve when the drug is given over an extended period dictates that one should weigh very carefully this damage against the clinical improvement to be expected. It may be that doses of only 1 to 1½ Gms. a day over prolonged periods of time may delay the onset of untoward reactions, lessen their severity, or eliminate them entirely.

f. In vitro Action. Culture-sensitivity tests and a study of experimental infections in animals have predicted to a certain extent in what infections streptomycin therapy may be of value, and in what infections it cannot be expected to have any effect. A list of the important pathogenic microorganisms which may show susceptibility to streptomycin appears in Table II.

Streptomycin differs from penicillin in these respects: (1) The most useful antibacterial property of streptomycin is its effectiveness against gram-negative bacteria; (2) It exhibits a strong antibacterial action on the gram-positive tubercle bacilli and enterococci; (3) It is generally less efficient than penicillin on other gram-positive organisms which are inhibited by both drugs; (4) It is ineffective in ordinary media on Clostridia and other anaerobic organisms; (5) Its in vitro action is greatest in alkaline media, while penicillin activity is optimal in a slightly acid environment.

The magnitude of the dose, measurement of unit, height of blood level required for therapeutic effect, and toxicity are other fundamental differences between streptomycin and penicillin.

g. Drug-fastness. Cultures of bacteria show a considerable variation in their susceptibility to streptomycin. Not all species of organisms listed in Table II will be found in actual practice to be inhibited by levels of streptomycin ordinarily produced in the blood by parenteral administration. Furthermore, bacteria rapidly develop indifference to ordinarily lethal concentrations of the drug. The drug is of no value against organisms insensitive to it in the laboratory. It is obvious, therefore, that routine sensitivity testing of cultures is an absolutely necessary guide to therapy. A high percentage of resistant members in the infecting bacterial population is usually

associated with no chemotherapeutic response. On the other hand, the presence of predominantly sensitive forms is coincident with beneficial chemotherapeutic effects, depending on local factors. Thus, the high specificity of streptomycin action on bacteria dictates that the drug should be used only in cases in which an accurate bacteriologic diagnosis has been made, sensitivity tests have established an indication for the drug, and there is a sound knowledge of the underlying pathology. No beneficial effects should be expected from its use on infections in tissues in which the drug does not come in direct and continuous contact. Drug-fastness and indifferent responses are a common feature in most cases in which the cardinal principles of treatment which govern the various fields of medicine and surgery have not been fulfilled. Streptomycin-fastness is permanent, and infections caused by resistant bacteria are unlikely to respond to a second treatment.

TABLE I
RECOMMENDED DOSAGES AND BODY FLUID LEVELS

1. Adults.

Intramuscular 0.25 Gms. q. 3 h.) (10-30 mcgm./cc. in serum
) maintains (500 mcgm./cc in urine
 or 0.50 Gms. q. 4 h.)
 Bile, peritoneal, pleural levels $\frac{1}{2}$ to $\frac{1}{4}$ serum level.

Intrathecal 1 mg./kg. every 24 or 48 hours. Maintains levels up to 10 mcgm./cc.

Intrapleural 0.25 to 1.0 Gm. q. d.

Aerosol 0.5 Gm. q. d.

Local 5 to 10 mg./cc. saline. 0.25 Gm. per 1 Gm. dried sterile plasma or lactose.

2. Children.

50-75 mg./lb./day parenterally.

TABLE II
ORGANISMS SUSCEPTIBLE TO STREPTOMYCIN IN
VARIABLE DEGREES

Aerobacter aerogenes	Corynebacterium diphtheriae
Alkaligenes fecalis	Diplococcus pneumoniae
Brucella abortus	Staphylococci
Brucella melitensis	Streptococci
Eberthella typhosa	
Escherichia coli	Bacillus anthracis
Hemophilus ducreyi	Mycobacterium tuberculosis
Hemophilus influenzae	
Hemophilus pertussis	Actinomyces bovis
Klebsiella ozenae	
Klebsiella pneumoniae	Rickettsiae
Neisseria gonorrhoeae	Epidemic Typhus
Neisseria intracellularis	Murine Typhus
Pasteurella pestis	Rocky Mountain Spotted Fever
Pasteurella tularensis	Rickettsialpox
Proteus morganii	
Proteus vulgaris	
Pseudomonas aeruginosa	
Salmonella species	
Shigella species	

For rapid estimates of sensitivity of bacteria to penicillin and streptomycin (modified from the published report of Bondi, et al., Am. J. Med. Sci., 213:221-225 (Feb.) 1947).

1. MATERIALS.

a. Solutions, 5-10cc. amounts:

- (1) 250 mcgm./ml. streptomycin in sterile distilled water.
- (2) 15 u/ml. penicillin in phosphate buffer ($\text{Na}_2\text{H}_2\text{PO}_4 \cdot \text{H}_2\text{O}$, -0.41 Gms. per liter, and Na_2HPO_4 - 0.28 Gms. per liter).

Solution of penicillin prepared weekly, stored in refrigerator.
 Solution of streptomycin prepared bi-weekly, stored in refrigerator.

- b. Filter paper discs 6.5 millimeter diameter from Whatman 42 (Medical Department Item No. 4-364-000) made with paper punch (Quartermaster Item No. 53P.36000 Perforator, Non-Adjustable, Two-Hole:), sterilized and contained in Petri dish.
- c. Fine forceps.
- d. 5 per cent blood infusion agar plates.

2. PROCEDURE. Apply culture swab across one side of the blood agar surface to cover approximately 4 sq. cm., and spread from this area with sterile loop. On the bottom of the plate mark one side of the swabbed area "penicillin" and the other, "streptomycin." With flamed forceps pick up a filter-paper disc, touch it to the anti-biotic solution, then apply it to the swabbed agar surface on the correspondingly marked side. Incubate aerobically 18 hours. Measure the diameter of the zone of inhibition. In the case of strict anaerobes a second plate is prepared and placed in the anaerobic jar for 24 to 48 hours.

3. RELATIVE SUSCEPTIBILITY BY THE DISC METHOD IN TERMS OF UNITS.

<u>Antibiotic</u>	<u>Zone of Inhibition</u> <u>mm.</u>	<u>Susceptibility Range</u>	<u>Relative Susceptibility</u>
Penicillin	>20	<0.1 u/ml.	Very
	10-20	0.1-0.4 u/ml.	Moderate
	<10	>0.4 u/ml.	Resistant
Streptomycin	>15	<4 mcgm./ml	Very
	10-15	4-15 mcgm./ml.	Moderate
	<10	>15 mcgm./ml.	Resistant

ASSAY METHOD

MATERIALS.

1. Sterile patient's serum or pooled sera (for pre-streptomycin level).
2. Stock solution streptomycin - 320 u/ml.
3. Twelve sterile Wassermann tubes.
4. Sterile distilled water.
5. Nutrient agar slant of control organism (Aerogenes-Friedlander Type A).
6. Broth: 2 per cent peptone, 1 per cent beef extract, 0.5 per cent NaCl in water adjusted to pH 7.8.

PROCEDURE.

Control (Pre-Strep)

1. Six Wassermann Tubes.

2. Add 0.5 cc. of sterile distilled water to the last 5 tubes.

3. To the first tube add 0.9 cc. of patient's serum ("pre-streptomycin), and 0.1 cc. of 320 mcgm/cc. (units/cc.) stock solution strep. Mix and take 0.5 cc. from the first tube and add to the second tube. Mix and make serial dilutions through the 6th tube. Discard the final 0.5 cc. from the last tube.

4. Add 0.5 cc. of broth seeded 1:50 with the 6 hour Aerogenes-Friedlander (type A) to each of 6 tubes. (0.5 cc. of culture to 25 cc. of broth).

5. Incubate 16-18 hours. Read.

Tube No.

Diln. mcgm./cc. strep.

Serum diln.

1

2

3

4

5

6

16

8

4

2

1

0.5

1/2

1/4

1/8

1/16

1/32

1/64

Test

1. Six Wassermann Tubes.

2. Add 1 cc. of sterile distilled water to the last 5 tubes.

3. Add 1 cc. of patient's serum ("treatment") to the first and second tubes. Mix. Make serial dilutions starting with the 2nd tube through the 6th. Discard the final 1 cc. from the last tube.

4. To each tube add 1 cc. of seeded 1:50 six hour Aerogenes-Friedlander broth. (0.5 cc. of culture to 25 cc. of broth).

Tube No.

Final Serum Dilution

1

2

3

4

5

6

1/2

1/4

1/8

1/16

1/32

1/64

CALCULATION: Streptomycin serum level = C/T where:

C equals lowest concentration of streptomycin which produces complete inhibition of growth in "Control."

T equals highest serum dilution which produces complete inhibition of growth in "Test."

Example: If 1 mcgm. (u)/cc. inhibits *Aerogenes-Friedlander* in "Control" while $\frac{1}{4}$ cc. serum in "Test" inhibits the organism, the blood serum level is 4 u/cc.

Urine may be assayed as the serum by making a 1/20 dilution and sterilizing by passing through a Seitz filter. The resulting concentration is multiplied by 20 to determine the urine concentration.

XV. Nursing Care of a Patient with Bulbar Poliomyelitis by 1st Lieut.

Reba L. Holland, ANC, 28th Station Hospital, Osaka, Japan.

Mr. A., a young white male 20 years of age, who is a War Department civilian, was admitted to the 28th Station Hospital 25 July 1947. On admission he gave a history of nausea, vomiting, fever and an inability to swallow of a three-days' duration. The patient first noted these symptoms while on a train from Tokyo to Shikoku. He was treated at the Shikoku MGT Dispensary and then transferred to this hospital by plane. The tentative diagnosis on admission was Gastritis, Acute, Catarrhal, cause unknown.

The physical examination revealed that he had an accumulation of mucus in the pharynx and an exaggerated gagging when swallowing was attempted. He also had an acute hoarseness and nasal quality to his voice, plus a rigid neck and spastic back muscles. In view of these symptoms it was the consensus of opinion that these symptoms were suggestive of poliomyelitis. A lumbar puncture was done. The spinal fluid was found to be clear; white blood cells 65; polymorphonuclear cells 8%; lymphs 92%; sugar 71.5 mgm%; Pandy was positive. These findings were interpreted to be consistent with a diagnosis of poliomyelitis, probably bulbar type. In bulbar poliomyelitis, involvement of the nuclei of the lower cranial nerves (10th, 11th, 12th) may cause paralysis of swallowing. This may produce death by occlusion of the airway. The prognosis is good if an adequate airway is maintained. The vital respiratory and circulatory centers may be involved in bulbar poliomyelitis, leading to central respiratory or circulatory failure.

Mr. A. was admitted to our communicable disease ward and placed in strict isolation. The most distressing feature at the time of admission was the accumulation of mucus in his pharynx. Steps were immediately taken to clear his pharynx. He was placed in a prone Trendelenburg position and an electric suction was used to give him a clear airway. He was also given Atropine Sulfate subcutaneously gr 1/150 every four hours to decrease any further secretion from the salivary glands. To prevent hypostatic pneumonia, he was turned frequently and given 30,000 Units of penicillin. He was treated supportably with intravenous fluids to maintain adequate fluids and electrolyte balance. A total of 3,000 cc of fluid was given each day intravenously by slow drip. This was given daily until swallowing reflex was regained. It was also supplemented with 100 mgm of Ascorbic Acid in each liter of fluid and 25 mgm Thiamin Hydrochloride twice daily. The vitamins were to prevent any nutritional deficiency that might occur. A tracheotomy set was kept in readiness at the bedside for use if the laryngeal spasms became great enough to prevent free passage of air into the lungs. He was placed on the seriously ill report as recovery was questionable.

During this time Mr. A. was well aware of his condition and extremely apprehensive. Not only did the nurses have to watch for new and untoward complications, but it was necessary to create a cheerful optimistic attitude for the patient to gain his confidence and cooperation. Each treatment had to be explained thoroughly, so that he would cooperate and not want to ask questions, because the attempted use of his vocal cords caused spasm and pain and this in turn caused new fear as the spasm produced a choking sensation. He was handled as little as possible to avoid spasm. Special care was exercised when he used the bed pan. He was supported and turned on his side, bed pan placed in position and pillows used as supports for his back were placed above and below the bed pan then he was rolled over on his back. Efforts were made to have an even room temperature with good ventilation but no drafts. Baths were not given until he could tolerate them. Oral hygiene was given with glycerine and lemon juice every hour when he

was awake to moisten and cleanse the mucous membrane of the mouth. This did not increase gagging. At frequent intervals a moist sponge was placed between his lips for moisture. Special nurses were necessary for three weeks.

On the 9th hospital day, he was able to swallow sips of water. At this time a Levine tube was passed and feedings of 100 cc of 5% glucose was given every 2 hours for ten feedings each day. This was supplemented with 2,000 cc of 5% glucose intravenously. Three days later eggnog solution was given every 2 hours through the Levine tube. This was sufficient nourishment and eliminated the necessity of intravenous feedings. On the 17th day the Levine tube was removed and feedings of jello and cereal were given by mouth. Milk was not used at first because it encourages an excess in mucus secretions. He was kept in prone position while being fed and the nurse had to watch him very closely. At first the very smallest amounts were given to him by spoon. The diet solidity was increased gradually and on the 36th hospital day he could eat regular diet.

Throughout the time that the patient had loss of swallowing function he was kept in a prone Trendelenburg position and care was given to relieve pressure from joints by alternating a pillow from under one shoulder to the other. By so doing the position of the patient was changed frequently but not too frequently. As he regained swallowing reflexes and facial muscle power the bed was placed in a normal position and he was allowed to turn as he wanted to when awake. When he was asleep he was placed in a prone position as he still had an increased pharyngeal secretion.

Physical Therapy of diathermy, electrical stimulation, and massage was given to the weakened facial muscles. The facial muscle power returned to almost normal and his speech improved daily. Mr. A. was cooperative throughout his hospitalization.

Except for a minimal residual weakness of the facial muscles and a slight nasal quality to his voice, his recovery was quite satisfactory and he was able to resume his regular duties and was discharged on the 72nd hospital day. Interestingly enough soon after his discharge, he was able to pass a final type physical examination for Regular Army.

SUMMARY: (1) The accumulation of mucus in the pharynx, the nasal quality of the voice, and the inability to swallow indicated involvement of the lower cranial nerve group. (2) The details of the nursing care in this type of bulbar poliomyelitis are described. (3) Prognosis in bulbar poliomyelitis limited to pharyngeal paralysis is good provided an adequate airway is maintained and meticulous nursing care is provided.

PART III STATISTICAL

Evacuation:

1. During the period 29 November to 26 December 1947, the following patients were evacuated from the several major commands:

	<u>AIR</u>	<u>WATER</u>	<u>TOTAL</u>
JAPAN	166	182	348
*KOREA	105	1	106
MARBO	31	3	34
PHILRYCOM	16	1	17

2. Evacuations per thousand strength for Patients awaiting evacuation as of
period 29 November to 26 December 1947: 26 December 1947:

JAPAN	3.7	73
KOREA	3.0*	21
MARBO	1.8	24
PHILRYCOM	.4	28
THEATER	2.6	

*Patients evacuated by air to Japan from Korea for onward evacuation.

Statistical data on Hospitalization and Admission Rates for the period 29 November to 26 December 1947 will be published in the May 1948 issue of the Surgeon's Circular Letter.

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